TOWARD A SUSTAINABLE ENERGY POLICY FRAMEWORK: U.S. EXPERIENCE AND CHINA'S OPPORTUNITIES

John Byrne and Bo Shen

Center for Energy and Environmental Policy
University of Delaware

Comparison of Energy Systems

Conventional Energy System

- Emphasis on GNP growth
- Fossil fuel sources dominate
- Production-focused energy policy
- Centralized energy services
- Large-scale systems
- Economic goals dominate

Sustainable Energy System

- Emphasis on long-term economic and environmental viability
- Greater reliance on renewable energy
- Conservation-focused energy policy
- Distributed energy services
- Increasing reliance on moderate-scale systems
- Balance of social, environmental, and economic goals sought

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Renewable Energy Policy

Policy Objectives

- Establish capacity and infrastructure for rapid renewable energy development
- Create sustained markets for renewable energy

Policy Types

- Institutional
- Regulatory
- Market-based incentives
- Market transformation

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U.S. Institutional Policies

National

- Government supported R & D
  (National Renewable Energy Laboratory)
- Government-industry partnerships
  to commercialize technology
  (DOE PV:BONUS)

State

- State-based renewable energy collaboratives
  (Delaware PV Working Group)

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U.S. Regulatory Policies

National

- Air quality standards
  (Clean Air Act Amendments of 1991)
- Technology forcing strategies
  (Best Available Control Technology)
- Energy-efficiency standards
  (National Appliance Energy Conservation Act of 1987)

State

- Integrated resource planning
  (mandated by 37 state regulatory commissions)

U.S. Market-Based Incentive Policies

National

- PURPA (avoided cost concept for comparing demand-side with supply-side options)
- Tradable emission permits with emission ceilings (Clean Air Act Amendments of 1991)
- Renewable energy production incentives and tax credits (EPACT 1992)

State

- Incorporation of environmental externality costs into resource evaluation plans
- Promotion of DSM through utility rebates
- Adoption of seasonal / time-of-use pricing by states (to reflect incremental cost of supply)

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U.S. Market Transformation Policies

National

- EPA Golden Carrot
- EPA Green Lights

State

- Renewable energy set-asides
- Green pricing

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What Did Not Work? (Unsustained Markets)

Solar Domestic Hot Water System Program (1978 Federal Energy Tax Act)

- Number of manufacturers dropped from 233 in 1980 to 51 in 1990
- Total shipped product (thousand m^2) dropped from 1,746 in 1980 to 1,026 in 1990

Central Station Solar Thermal Technology (Luz Corporation)

- Forced into bankruptcy after federal and state tax credits were removed

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What Did Not Work? (Insufficient Incentives)

Tradeable Permits

- SO_2 tradeable permit market established in 1993 for electric utilities
- Current market price of SO_2 approximately $150 / ton
- Very few trades have been made to date

Incorporating Externalities

- Several states require utilities to consider externality values during resource selection
- Values range widely: $830 - $18,000 per ton of SO_2, $8 - $74 per ton of CO_2, and $69 - $18,262 per ton of NO_x
- Little impact on overall resource selection

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What Worked?
(Sustained Markets)

Wind Power

- Renewable energy tax credits led to sustained market development for wind power technologies (400 MW installed, 1992)

- Recent competitive bids for wind power in Minnesota came in at 3¢ / kWh, comparable to conventional generation options

What Worked?
(Successful Regulations)

Integrated Resource Planning

- Stimulated investments in energy efficiency

- Strong relationship between IRP process and demand-side investments by utilities

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What Worked?
(Effective Incentives)

Pricing Policies

- Seasonal / time-of-use pricing increases value of renewables in a peak-shaving role

Utility Rebate Policies

- Stimulated investments in end-use efficiency (U.S. utilities spent $2.8 billion on DSM in 1993)

What Worked? (Market Transformation)

Golden Carrot

- Utility incentive to manufacturers to develop a CFC-free refrigerator that uses 25% to 50% less electricity than conventional models
- 25 utilities participated in the incentive program
- The winner, Whirlpool, delivered 250,000 super-efficient non-CFC refrigerators
- Projected decrease of 650,000 tons of CO_2

Green Lights

- Voluntary agreement with groups to upgrade lighting efficiency and quality to profitably prevent pollution over 1,500 participants to date
- Prevented 540 million Kg of CO_2, 3.92 million Kg of SO_2, and 1.85 million Kg of NO_x

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Promising Alternatives

Green Pricing

- Premium pricing to promote adoption of renewable energy technologies
- Sacramento Municipal Utility District PV Pioneer Program: 240 residential installations (approximately 1 MW of PV)

DOE PV: BONUS Program

- Collaborative effort involving PV, building, and utility industries to develop near-term, sustainable markets
- Development of dispatchable peak-shaving PV system
- Development of building-integrated PV materials and products

Institutional Framework for China's Sustainable Energy Development

- Establish a national renewable energy institute with provincial affiliates (including university centers)
- Support the development of province-based collaboratives to identify renewable energy opportunities and to document barriers
- Promote government-industry partnerships to commercialize renewable energy technologies

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Responsibilities of a National Renewable Energy Institute

- Resource assessments
- Economic feasibility studies
- Market analysis
- Policy studies
- Technology development and evaluation

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Regulatory Policy Options for China's Sustainable Energy Development

- Central government adoption of integrated resource planning principles and support of province-based integrated resource planning
- Establish comprehensive national air-quality standards
- Create national energy-efficiency standards (e.g., lighting, appliances and automobiles)

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Incentive Policy Options for China's Sustainable Energy Development

- Remove subsidies for non-renewable energy sources
- Establish avoided cost mechanism for resource evaluation
- Adopt time-of-use and other cost-based pricing
- Consistent tax treatment for energy expenditures (e.g., PV has no fuel costs to be deducted from revenues for tax purposes - This should NOT penalize its adoption)
- Adopt national and local tax incentives for renewable energy technologies (e.g., sliding scale tax exemptions / credits)
- Create utility incentives for the use of renewable energy technologies (e.g., rebates and shared savings)

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Market Transformation Policy Options for China's Sustainable Energy Development

- Central government promotion of new market opportunities for renewable energy technologies (e.g., Golden Carrot)
- Target key provinces for the development of specific renewable energy options and provide institutional support
- Province-based renewable energy set-asides

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International Cooperation to Support China's Sustainable Energy Development

- Seek capacity-building and institutional support from multilateral organizations, including World Bank, GEF, and UNDP
- Take advantage of global environmental quality monitoring to target renewable energy development
- Clarify institutional basis for cooperation with China in the transfer of renewable energy technologies
- Promote worldwide information exchange on renewables

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China’s Agenda 21

China’s existing energy structure is based on non-renewable fossil fuels, which inevitably leads to continuing depletion of energy resources. . . Renewable energy resources can be replenished after depletion and produce very little or no pollutants, thus providing the basis for China’s energy structure of the future. (Items 13.52 and 13.53)

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